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Consumer Informatics and Digital Health

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Chapter 3
Using Information Technology at Kaiser Permanente to Support Health Equity

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Kaiser Permanente: Toward Health Equity for Individuals and Communities

Kaiser Permanente is the largest not-for-profit integrated health care system in the USA, with more than 11 million members in eight states and the District of Columbia (Kaiser Permanente, 2016a). Headquartered in Oakland, California, Kaiser Permanente evolved from industrial health care programs for shipyard, construction, and steel mill workers in the 1930s and 1940s to its present form.

Today, Kaiser Permanente is a mutually exclusive partnership and contractual alliance among a not-for-profit insurer, Kaiser Foundation Health Plan, a not-for-profit hospital system, Kaiser Foundation Hospitals, and eight physician organizations, the Permanente Medical Groups (Crosson & Tollen, 2017). In each of Kaiser Permanente's geographic regions, the Health Plan offers coverage and the associated Medical Group provides or arranges for professional services for a negotiated per-member fee. Together, the entities that make up Kaiser Permanente employ about 21,600 doctors, 54,000 nurses, and 199,300 technical, administrative, clerical, and caregiving employees at 38 hospitals and 661 medical offices (Kaiser Permanente, 2016a).

Kaiser Permanente's mission is "to provide high-quality, affordable health care services to improve the health of our members and communities we serve" (Kaiser Permanente, 2017a). This paired focus on the health of individuals and the communities in which they live is driven by an understanding that health is "produced" by much more than medical care; it also comes from living in a healthy social,

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economic, and physical environment (McGinnis, Williams-Russo, & Knickman, 2002) (Fig. 3.1). This perspective is embodied by Kaiser Permanente's vision of "Total Health"—an imperative to re-imagine all business units and the entire work-force, as well as patients, communities, and partners, as producers of health, affecting upstream social, economic, and environmental determinants of health.

Kaiser Permanente's commitment to individuals and communities also derives from the organization's core value of health equity, which has two major components: (1) the notion that the organization's own patients (called "members") must have equal access to the highest-quality care, regardless of socioeconomic or any other factors; and (2) the notion that health systems must address unhealthy environmental factors that disproportionately pose barriers to both members' and the larger community's ability to thrive.

Beginning in 2003, congressionally mandated national reports on health care quality and disparities have tracked non-clinical variations in access and care delivery associated with race, ethnicity, and socioeconomic status (Moy, Dayton, & Clancy, 2005). The most recent report found that access and quality of care were improving, but wide variations and health disparities continue (Agency for Healthcare Research and Quality, 2016). The development of indisputable evidence of disparities has been facilitated by an ever-evolving research infrastructure and new analytic methods to summarize, standardize, and report disparities across measures and settings (Moy et al., 2005). For example, the development of geocoding and spatial analysis has helped to identify "hot spots" where individuals and communities experience a disproportionate share of chronic disease, helping planners
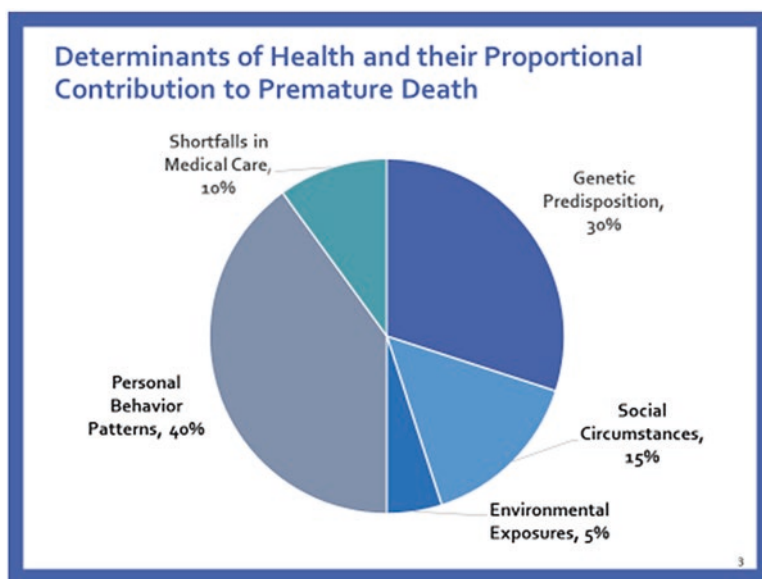
Fig. 3.1 Health is influenced by many factors in addition to medical care. Source: Adapted from McGinnis et al. (2002)

and health systems target resources where the need is greatest (Columbia University Mailman School of Public Health, n.d.).

Investments in electronic health records (EHRs) also contribute knowledge about health disparities (Diamond, Mostashari, & Shirky, 2009), particularly when combined with data from sources such as vital statistics and registries. Kaiser Permanente was one of the first health care systems to implement a comprehensive EHR and to develop clinical analytics (Burns, 2014), allowing the organization to provide national thought leadership and models for leveraging information technology (IT) to help address health disparities.

Health IT is a key feature of Kaiser Permanente's care delivery strategy, the goal of which is to provide customized care, taking into account not only clinical needs, but also aspects of a patient's and community's social background—vital components of health and wellness. This chapter discusses health information technologies that engage patients and physicians, raising the bar on health care quality for all and thereby improving health equity.

Addressing Health Equity Among Kaiser Permanente Members

Kaiser Permanente has made a national commitment to reducing disparities related to members' age, gender and gender identity, sexual orientation, geography, ethnicity, language, and cultural background. The organization's members speak nearly 200 languages and come from diverse communities with unique beliefs about health and many different values and traditions. To care for this diverse population, the organization provides its physicians and clinical staff with training and support tools.

Nearly 20 years ago, workforce training focused on cultural competency and was built around a series of manuals addressing the specific care needs and preferences of different populations. Today, the focus on cultural competency has given way to a focus on "cultural humility"—the notion that it is less important for clinicians to know, in advance, what cultural issues might come into play with a given patient based on his ethnicity, but rather that they should be skilled in asking questions to elicit culturally informed care goals and preferences from all patients. To support physicians and staff in focusing on culturally and linguistically appropriate care, Kaiser Permanente also has a strong commitment to inclusive leadership and training in cross-cultural agility—a learnable skill (Caligiuri, 2012).

This section illustrates how Kaiser Permanente's use of IT and analytics has enabled the organization to address disparities among its members—by allowing it first to *detect* them. Next, it describes the many ways that Kaiser Permanente harnesses IT to work toward reducing disparities.

Identifying the Problem: Detecting Disparities

Historically, one of the greatest challenges facing Kaiser Permanente—and any delivery system committed to reducing health disparities—was a lack of meaningful and accurate data on patient ethnicity and language. (The Meaningful Use EHR Incentive program did not require providers to collect such data until 2011 [Office of the National Coordinator for Health Information Technology, 2014].)

Prior to the adoption of advanced health IT, Kaiser Permanente could obtain *some* information regarding disparities among groups of members, but data sets were not uniform. Patient identification of ethnicity and/or language preference was not standardized system-wide, leading to gaps and inconsistencies, as well as a data collection process that was expensive, fragmented, and not used to drive systematic performance improvement.

The lack of a uniform database permitted only partial analyses of gaps in care related to ethnicity and race, which were grouped according to the prevailing six categories used by the Office of Management and Budget (OMB): American Indian or Alaska Native, Asian, Black or African American, Hispanic or Latino, Native Hawaiian or Other Pacific Islander, and White (Office of Management and Budget, 1997). However, analysts found the effectiveness of this approach to be limited. In 2004, as part of a national collaborative among health plans, Kaiser Permanente began working with researchers from the RAND Corporation to implement a predictive model to impute race/ethnicity for groups of patients based on both surnames and census tract information. The methodology did not "assign" ethnicities to individual patients, but rather allowed the organization to track care and outcomes for *groups* of patients.

The imputed methodology worked well for Kaiser Permanente. It allowed leaders to see, for the first time, clear evidence of disparities in clinical outcomes and processes associated with differences in race and ethnicity across Kaiser Permanente's eight operating regions and collectively as a national organization. This finding provided the impetus for the organization to invest resources in incorporating a question about patient self-identification of race and ethnicity into patient intake protocols.

Initially, Kaiser Permanente was able to obtain ethnicity data from about 50% of members and continued to rely on the imputed methodology for the rest. Today, Kaiser Permanente leaders estimate that they have patient-reported language and ethnicity data from close to 90% of members. To maintain statistical validity and external generalizability, most analyses of disparities group patients into the OMB's six mega-categories.

However, Kaiser Permanente's systems collect the information in such a way that, if needed, the organization can drill down below those categories to look at information for 240 categories of ethnicity that are used by the United Nations. Ultimately, the EHR now provides Kaiser Permanente with a richly layered profile of membership—including vital demographic data—that is constantly refreshed and can reveal patterns of disparities in processes and clinical outcomes.

The organization has incorporated equity measures into its national "quality dashboard" for senior leaders and also produces quarterly equitable care reports—comprised of 24 quality measures that are stratified by the OMB's six categories of race/ethnicity (Table 3.1). These measures align with the organization's national quality priorities and focus on areas that have been shown in the research literature to have significance for disparities. The equitable care reports ensure that equity is maintained or improved as overall performance improves.

Addressing the Problem: Using Technology to Support Member Health and Health Equity

Kaiser Permanente's member-centered, coordinated health IT ecosystem combines tools, resources, processes, and workflows in an integrated environment. Implementation of the EHR—known as HealthConnect®—made it possible for Kaiser Permanente to gather clinical information from visits, labs, pharmacy, and all other sources in one place. The EHR is itself integrated with population health management tools, patient/provider interfaces, and administrative and consumer support systems (Fig. 3.2). All of these systems, as well as other information technologies that support member health and health equity, are described in this section.

In many cases, the systems and processes described here were developed using human-centered design principles. A cornerstone of innovation at Kaiser Permanente, human-centered design brings together the people who will use a new service, product, or technology to co-design it with those who will deliver it. In practice, this

Table 3.1 Kaiser permanente tracks 24 equitable care measures

Prevention and screening	*Cardiovascular conditions*	*Diabetes*
• Breast cancer screening • Cervical cancer screening • Colorectal cancer screening • Childhood immunization status • Immunizations for adolescents • Human papillomavirus vaccine for female adolescents	• Persistence of beta-blocker treatment after a heart attack • Controlling high blood pressure statin therapy for patients with cardiovascular disease: −Received Statin Therapy −Statin Adherence 80%	Comprehensive diabetes care: • HbA1c testing • HbA1c s≤ 9.0% • HbA1c < 8.0% • Retinal Eye Exam • Medical Attention for Nephropathy • BP < 140/90 Statin therapy for patients with diabetes: • Received statin therapy • Statin adsherence 80%
Behavioral health	*Medication management*	
Antidepressant medication management: • Effective Acute Phase Treatment • Effective Continuation Phase Treatment	Annual monitoring for patients on persistent medications: • ACE or ARB • Digoxin • Diuretics	
		Respiratory conditions
		• Asthma medication ratio

Source: National Health Plan & Hospital Quality, Kaiser Permanente. Used by permission

Fig. 3.2 Kaiser Permanente's integrated clinical information systems support member health. Source: Kaiser Permanente. © Used by permission

means that patients are often involved in the design of patient-facing materials and tools, and physicians are similarly involved in the development of tools intended for their use.

Electronic Health Records: HealthConnect®

In 2010, Kaiser Permanente completed the implementation of HealthConnect, the largest civilian EHR in the USA. HealthConnect is more than just an electronic medical record; it is an organization-wide system that integrates the clinical record and decision support with appointments, ancillary and specialty services, registration, and billing.

HealthConnect supports a patient portal (see below) and serves as a personal health record for members and others receiving care at Kaiser Permanente. Inputs from laboratory, imaging, pharmacy, membership, and other departments support population-management activities, such as disease registries and risk stratification calculators. The system also supports quality-improvement efforts and generates reports that promote conversations with providers about their performance relative to that of their peers in clinical quality, safety, efficiency, equity, and service.

Deployment of HealthConnect meant replacing multiple legacy systems in use across Kaiser Permanente, some of which were well established. In fact, in the late 1990s, three different Kaiser Permanente regions received the Davies Award from the Health Information and Management Systems Society (HIMSS) for implementing EHRs. When leaders made the difficult decision to bring all regions onto the same EHR, the organization evaluated several products that proved unable to support the complex needs of the organization (with eight million members at that time). Ultimately, Kaiser Permanente selected a commercial EHR vendor to build HealthConnect, but it still required seven years and approximately $4 billion—the largest capital project in the organization's history. By comparison, the most recent hospital completed in the Kaiser Permanente system (in 2017) cost $850 million and took three years.

Successful roll-out of the system was a top priority for leadership and required a high level of commitment from all parts of the organization. Implementation of the EHR has brought about significant workflow change at Kaiser Permanente, particularly for the physicians and other staff who interface with the tool. Leaders found that technical implementation was necessary but insufficient. It was also necessary to focus on user-centered design and training in the context of workflow. Often, the workflow itself needed to be altered to take advantage of the technology to achieve net benefit.

Ultimately, Kaiser Permanente's goal is to use the EHR to transform care and service delivery. From a quality perspective, connecting care teams with patients and with consistent, organized, prioritized information makes decision-making and care management easier. Kaiser Permanente's experience with HealthConnect demonstrates that making comprehensive health information available to all clinicians, as well as to patients, provides the foundation for a fundamental rethinking of the delivery of health care—who provides care, how care is provided, and what care outcomes are achievable (Liang, 2010).

As one of the earliest (and largest) adopters of comprehensive EHRs in the USA, Kaiser Permanente has played an important leadership role, both here and around the world, in developing industry standards for the use of such tools. Kaiser Permanente holds leadership positions in multiple national and international standards development efforts and organizations, such as Health Level 7 International (HL7), OASIS, the American National Standards Institute, the International Organization for Standardization, and the World Wide Web Consortium. The organization also influences health IT standards by providing input to regulatory agencies and industry groups through comment letters, testimony, and participation in advisory bodies.

Provider-Facing Population Health Management Tools

The EHR is integrated with population and panel management systems used by physicians and staff. Panel management is a set of tools and processes for population care applied systematically at the level of primary care (Neuwirth, Schmittdiel,

Tallman, & Bellows, 2007). Specific tools vary across Kaiser Permanente, but the basic components are the same, as is the goal—to empower team members, whether they are primary care physicians, specialists, or staff members, to identify and address gaps in care across the entire member population.

In Kaiser Permanente's Southern California region, clinicians use a system called Permanente Online Interactive Network Tools (POINT) to identify and address care gaps (Kanter, Lindsay, Bellows, & Chase, 2013). The system integrates clinical data from the EHR and uses an algorithm to identify patients with chronic disease who are "missing" needed treatments or tests, based on best-practice guidelines.

The system can generate a chronic care summary sheet, providing physicians with high-level information about the treatment and monitoring of chronic conditions among their panel of patients. It also creates point-of-care alerts in the EHR and prompts all team members—from physicians to pharmacists to receptionists—to offer the missing care to patients during each encounter (this "inreach" strategy, called the "Proactive Office Encounter," has been particularly successful in closing gaps in both chronic and preventive care in Kaiser Permanente Southern California [Kanter, Martinez, Lindsay, Andrews, & Denver, 2010]). To help close care gaps for patients who may not have had a health system encounter recently, the system creates risk-stratified follow-up lists so that staff can reach out to them proactively by phone or other methods.

Disease registries are another important tool in panel management. Using data extracted from the EHR, a disease registry is a list of all patients in a given practice (or medical center or a larger region) who have a specific condition or procedure. Such registries support quality-improvement initiatives for target populations that are identified by local clinical leaders; for example, diabetic patients with hemoglobin levels higher than the desired threshold. Working with these registries, staff members review selected patient charts, identify opportunities to align care with evidence-based guidelines, and initiate protocol-based orders for tests or medication (Kanter et al., 2013). Physicians then either approve or modify these orders.

A critical aspect of population health management tools is that they are shared by all clinicians and staff providing clinically oriented service to members. As such, these tools support the entire delivery system in preventing gaps in care, or closing those gaps wherever and whenever they may become evident—not solely during primary care visits.

Patient Portals: My Health Manager

While population health management tools support clinicians and staff, Kaiser Permanente also employs a variety of technologies to help patients play a role in their own care. Perhaps most important among these is the patient portal, My Health Manager.

In the late 1990s and early 2000s, Kaiser Permanente was among early adopters of patient portals or electronic tools for patient-centered communication. The organization's first informational patient website became interactive in 2003, when the Northwest region (Oregon and Washington) piloted a new functionality that allowed secure member access to parts of the EHR. Today, an online portal called My Health Manager is available in all Kaiser Permanente areas and can be accessed by registered and authenticated users through the website www.kp.org or through a mobile app. Registered members can use it to send and receive secure email with their physicians, schedule routine appointments, view past visit information, refill most prescriptions, see most lab test results, and access plan/payment information and health education materials. In 2015, about 70% of eligible Kaiser Permanente adult members, or 5.37 million people, had registered to use My Health Manager (Garrido, Raymond, & Wheatley, 2016).

Kaiser Permanente has found that use of secure email between providers and patients is associated with improved outcomes and stronger patient-centered care. Use of email is associated with a 2–6.5% improvement in Healthcare Effectiveness Data and Information Set (HEDIS) performance measures (Zhou, Kanter, Wang, & Garrido, 2010). In a 2011 internal Kaiser Permanente study, nine out of 10 patients with chronic conditions said My Health Manager enabled them to manage their conditions more effectively.

Patient portal use also raises patient satisfaction and loyalty to the health plan. Internal Kaiser Permanente research indicates that members who emailed their primary care providers reported high satisfaction with their email experiences (85% rated email encounters an 8 or 9 on a 1-to-9-point scale). My Health Manager users are also 2.6 times more likely to remain Kaiser Permanente members than are non-users (Turley, Garrido, Lowenthal, & Zhou, 2012).

At Kaiser Permanente, the impact of secure email use on other types of utilization, such as office visits and telephone contacts, is complex. Though various studies' findings have been inconsistent (Meng et al., 2015; Palen, Ross, Powers, & Xu, 2012; Reed, Graetz, Gordon, & Fung, 2015; Zhou, Garrido, Chin, Wiesenthal, & Liang, 2007), internal research shows face-to-face visits per member per year have fallen slightly while secure email visits per member per year have risen substantially, suggesting that technology is increasing access to primary care by allowing more contact with patients than in the past (Garrido et al., 2016).

Despite their benefits, there is a concern that patient portals create their own type of disparities by disproportionately benefitting people with access to technology and the skills to use it. Kaiser Permanente tracks this issue closely. Internal research has found the following regarding use of My Health Manager: members with the highest registration and use rate are between 60 and 69 years old; registered members are more likely to be white (non-Hispanic) than those who are not registered (Roblin, Houston, Allison, Joski, & Becker, 2009); and even after adjusting for age, gender, income, and other factors, Asian Americans, Latino Americans, and African Americans were 23%, 55%, and 62% less likely to register, respectively, than non-Hispanic whites (Garrido et al., 2015).

Multimedia Patient Education Tools

Kaiser Permanente deploys a wide variety of multimedia tools to help educate patients about health issues, often targeting areas of known health disparities. For example, internal data around clinical process measures spurred a Kaiser Permanente Northern California effort to improve colorectal cancer screening among Latinos. (Disparities between whites and Latinos in colon cancer screening have been well-documented nationwide [Jackson, Oman, Patel, & Vega, 2016.])

The project's goal was to increase the rate of Latino members who complete a noninvasive, in-home screening called the fecal immunochemical test ("FIT kit"). To accomplish this, the organization worked with Latino members to co-design, in Spanish, the FIT kit instructions and materials. As a part of this human-centered design process, member-advisers also helped design a Spanish-language instructional video (available online and in clinics) and a series of photo novellas to explain the importance of screening and demonstrate how to use the screening test at home.

Member involvement in the process led to identification of culturally relevant nuances that might otherwise have been missed. As a result of these and other efforts across Kaiser Permanente Northern California, the gap between the FIT screening rate for white members and Latino members decreased by 16% over a one-year period (Radding, 2017).

Mobile Apps

Increasingly, mobile apps are becoming an important tool for Kaiser Permanente to connect with members apart from visits to a health care facility. The organization's interest and work in mobile apps stems from a desire to make care more convenient for members and to "meet them where they are." While there are literally thousands of mobile apps that can help people stay healthy or manage chronic conditions, Kaiser Permanente has focused its development efforts on those that interface with the organization's EHR. For example, the previously noted My Health Manager mobile app has almost all the functionality of the My Health Manager web portal (see "Patient Portals," above), including secure email with providers, appointment scheduling, prescription refills, and access to some lab results.

"MyKPMeds," an EHR-connected app used in Kaiser Permanente's Northern California and Mid-Atlantic States regions, helps members manage complex and/or new medication regimens. Kaiser Permanente first piloted MyKPMeds with patients who had been discharged from the hospital, as post-discharge medication error is a major contributor to re-hospitalization.

Since then, the organization has found that it is also effective for patients—such as those with HIV—who have ongoing and complex medication regimens, or for those who face non-medical barriers to medication adherence, such as food or housing insecurity. MyKPMeds provides registered users with a list of their medications (including photos of each pill) and gives them the option of setting alarms when it's time to take each one. Members can also refill prescriptions through the app. Most

importantly, if the provider changes the regimen—either during an office visit or through a phone or email consult with the patient—and the change is made in the EHR, the information in the app is automatically updated.

Mobile apps can be especially important in helping Kaiser Permanente providers stay continuously engaged with more vulnerable patients—those who, due to medical or social circumstances, may find it difficult to schedule and keep face-to-face health care appointments. Research indicates that in 2015, fully 77% of US adults owned a smartphone, and that rate varies only slightly by ethnicity and income (Pew Research Center, 2017). As a result, Kaiser Permanente views mobile apps as a means of providing a broad cross-section of members with additional points of access and support.

Telehealth

While definitions of "telehealth" services vary, most include at least three broad categories, all of which are used at Kaiser Permanente: 1) audio, visual, or web-based technologies that facilitate two-way, real-time communication between patients and providers (e.g., telephone and video visits); 2) remote monitoring that allows providers to observe patients, using telecommunication technology (e.g., a patient transmitting blood pressure data to a provider using a wearable device); and, 3) asynchronous "store-and-forward" technology that transmits information from patients to providers or among providers without requiring simultaneous engagement (e.g., a provider transmitting an EKG to another provider for review and diagnosis). The goal is to remove time- and distance-related barriers to care.

Kaiser Permanente's use of secure email between patients and providers is discussed above (see *Patient Portals*). In addition, the organization offers patients the option of a telephone visit in many circumstances, often with no patient copay. In 2015, Kaiser Permanente members had 36.7 million telephone encounters with doctors, support staff, and other care team members (Kaiser Permanente, 2016b). In some specialties, digital photography and video-enabled visits are also available. For example, Kaiser Permanente first began using photography for remote consults in dermatology as a tool for primary care physicians to confer with specialists in near-real time. The organization also uses video in dermatology, either as a means for patients to check in with providers from home or for a dermatologist to connect with a patient and a primary care provider in real time during a primary care visit (Wheatley, 2015).

Today, video visits for primary care, neurology, mental health, and other specialties are in various stages of development and deployment at Kaiser Permanente. Patients connect with providers via video using a secure application that interfaces with the EHR. This technology holds particular promise for the care of patients recently discharged from the hospital. The video connection can be facilitated by a home health nurse, if needed, giving the physician an opportunity to observe the home environment to better understand any factors (including social factors) that will help or hinder the recovery process.

For routine care, video and telephone visits are especially useful in situations when members' work, school, or family caregiving responsibilities prevent them from attending in-person appointments during regular office hours. Video and telephone visits can save members and the organization the extra expense that would otherwise be associated with an after-hours urgent care visit or an unnecessary visit to the emergency room for care that does not require such a setting.

For patients with chronic conditions, Kaiser Permanente is piloting another telehealth technology: remote in-home monitoring. For example, one pilot focuses on glucose levels in people with diabetes, and one focuses on blood pressure levels in people with hypertension. In both cases, the patient wears a monitoring device that transmits data via Bluetooth through a receiver to the physician, using the EHR. In the future, this platform may be useful for monitoring other conditions, such as sleep apnea.

To some extent, legal and regulatory barriers limit the ways Kaiser Permanente—and other providers—can use telehealth tools. One important barrier is related to payment. Medicare's traditional fee-for-service program pays providers for care furnished using telehealth technologies only in rural areas. However, Kaiser Permanente serves the Medicare program primarily as a capitated Medicare Advantage plan, and as such, may provide telehealth services but must categorize them as "extra services." This means a potential reduction in other extra benefits or higher member premiums. In addition to Kaiser Permanente, several coalitions, including the Coordinated Care Coalition and the American Telemedicine Association, are working to influence policymakers to expand the use of remote access technologies in Medicare (Wheatley, 2015).

State medical licensing laws can also present a challenge for the use of telehealth by delivery systems, such as Kaiser Permanente, that span multiple states. Such laws bar physicians and other clinicians from providing services to people outside of the state in which they are licensed. The Federation of State Medical Boards has introduced an Interstate Licensure Compact that creates a new licensing option under which qualified physicians seeking to practice in multiple states could obtain expedited licensure in all states participating in the Compact (Wheatley, 2015). In the meantime, some Kaiser Permanente physicians obtain licenses in multiple states. This is particularly common in the Mid-Atlantic region, where patients often cross state borders (e.g., Virginia and Maryland) and travel to other states for extended periods(e.g., retired members living in Florida for the winter).

Implications for the US Delivery System

Kaiser Permanente is often considered an anomaly in the health care industry, given its structure and prepayment model, as well as its emphasis on prevention, population health management, community health, health equity, and the use of technology to augment whole-person care. However, over the past decade or so, there is growing awareness and acceptance of these principles from other health care

stakeholders. Most recently, there have been a series of "nudges" from federal and state health policy leaders that signal movement toward more integrated and coordinated care, with value prioritized over volume. The shift from volume- to value-based health care is driving an increased interest in managing the health of populations by targeting interventions to the right people at the right time (Numerof, 2015), an undertaking that requires a capacity for sophisticated analytics.

Kaiser Permanente's unique organizational structure and prospective payment model create a compelling business case for the organization to invest in the IT infrastructure necessary to manage population health and address disparities. However, other delivery systems that operate under different payment arrangements—and that do not have such a well-defined "member" population—also need to move in this direction, and many are doing so.

In fact, one could make the case that there are ways in which less integrated care and coverage models have an advantage over Kaiser Permanente in terms of using IT to support whole-person care. There has been pressure on them to develop capabilities to transfer data and information across organizational boundaries—among providers, from provider to payer, and the like. Such interoperability among delivery system stakeholders is critical to providing coordinated care.

Whether the term "population" is used to refer to people who live in a certain geographic area, who have a certain medical condition, or who belong to a particular health plan, population health management calls for the vision and tools to provide care for individuals and groups, both within and outside of traditional clinical settings. One of the fastest-growing areas in health systems and clinical analytics is the integration of claims data (from legacy systems) and clinical data from EHRs to improve performance, identify gaps, and improve patient care and safety.

A recent HIMSS analytics survey found that 80% of surveyed organizations with 100 or more beds are undertaking population health planning and patient-centered analytics (Health IT Analytics, 2015). For smaller practices, the current focus is more on joining an accountable care organization, expanding an integrated delivery network, or looking into the new EHR-based tools. The market for population health management tools is predicted to double by 2020, when it could reach nearly $32 billion (Tractica, 2015).

Conclusion: Challenges and Opportunities Ahead

Kaiser Permanente's technology-supported care delivery strategy reflects the knowledge that good medical care is necessary but insufficient for achieving health. Good health requires community engagement, both to understand what communities want from delivery systems and because delivery systems rely on community assets to deliver on their mission.

This chapter has illustrated how technology can help delivery systems broaden access, close care gaps, and reduce disparities. However, there remain significant

questions and challenges in optimizing technology to improve health. As such, Kaiser Permanente leaders are focused on the following imperatives:

- *First, do no harm.* Evidence from sectors outside of health care indicates that technology divides people and can increase disparities. How do we ensure that technology improves overall quality, of which equity is a key component? Going forward, Kaiser Permanente must continue to identify where utilization of health technologies may have disproportionate benefit to those who are already socially advantaged, lest it exacerbate or create new disparities. The distribution of technology is, in and of itself, an opportunity to enhance equity or contribute to yet another layer of challenges which give rise to unequal outcomes. Ultimately, the benefits or harm associated with technology will be determined by Kaiser Permanente's fidelity to its underlying organizational values of inclusion and diversity.
- *Measure what matters.* Delivery systems have become adept at classifying patients (e.g., with ICD-10 codes), capturing actions to support them (e.g., with CPT codes), and measuring performance (e.g., with HEDIS). However, as of yet, there is no systematic way to capture a person's circumstances (e.g., burdened by automobile expenses), preferences (e.g., dislikes the idea of chronic medication), or goals (e.g., wants to complete a 5 k run). Can technology help close these information gaps? Can it be effective in achieving equitable health if the gaps persist?
- *Know what works best.* Technology of the type discussed in this chapter changes much more rapidly than other tools in the care delivery system. How do we understand both what works and how to optimize the use of these tools in the context of alternative and complementary assets?

If delivery systems can address these questions, they have a better chance of leveraging technology to engage members and communities in preserving and improving health. Doing so will also require a strong cadre of health care providers who understand the power of community health and are committed to working with diverse partners.

To that end, Kaiser Permanente will open the doors of an innovative medical school in the fall of 2019. One of the school's explicit goals is to increase diversity and promote inclusion in the physician workforce and improve the health of underserved populations. In addition to clinical learning, the curriculum will emphasize health equity, community service, and leadership. It is also part of the organization's vision for the school to be a transformative force in medical education by incorporating technology more fully into the learning process. Accordingly, the medical school will provide a technology-enhanced learning environment, including augmented and virtual reality tools to teach anatomy and digitalized clinical case studies integrated with gamification techniques and accessible through multiple access points to enhance team discussion, without need of formal lecture halls.

Finally, it is important to return to a point from the start of this chapter—that social and environmental factors, as well as personal behavior, play a much larger role in health than does medical care. That is why Kaiser Permanente's mission is to

serve not only its members, but also the communities in which they live and work. Without healthy and supportive communities, people cannot thrive. Sadly, the USA as a whole vastly underinvests in the "social care" services that support health, compared to most industrialized nations (Squires & Anderson, 2015). Kaiser Permanente leaders believe that, to be effective, health care delivery systems must address this shortcoming and have an obligation to do so. In 2016, Kaiser Permanente distributed nearly $82 million in grants to community-serving organizations (Kaiser Permanente, 2017b).

Going forward, leaders hope to build upon information technologies that support high-quality, equitable care for members, leveraging them to address gaps in social care as well as health care, and benefitting communities more broadly. This will require financial and human investments, as well as strategic partnerships with other health systems, community service providers, and the public sector.

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